Light-Storing chip

Researchers at Stanford University have come up with a scheme to store light pulses, under ordinary conditions, using photonic crystal-semiconductor chips. They contain regularly spaced holes or rods of a different material. The aim is to make high-speed, low-power chips that channel light rather than electricity.

The method would allow light pulses to be stored in microchips at room temperature, and could lead to inexpensive chips that power all-optical communications switches, quantum computers and quantum communications devices.

The method calls for tuning a line of optical cavities embedded in photonic crystal, to resonate at the same frequencies as a light pulse so the pulse enters the device, and then changing the frequencies in order to shunt the pulse into a series of side cavities and briefly hold it there.

Key to the method is a way to tune the photonic crystal refractive index that consistently lowers the frequency of all of a pulse's wavelengths. This prevents the pulse from spreading out so much that it disappears as it slows down. This allows pulses to be stored long enough to interact, which means switching light signals in high-speed communications equipment or link photons in quantum computers.

Researchers expect a demonstration should take place within a year, and a practical prototype that works at optical frequencies could be made in two to five years.

Laser diode modulator

Sipex Corp, provider of analog ICs, announced its first laser diode modulator, the SP8110. Specifically engineered for DVD video players, the SP8110 features two output channels, a 400MHz on-chip adjustable oscillator and an extended temperature range of -40C to +85C degrees.

The SP8110's two output channels are individually programmable up to 130mA, to operate two grounded laser diodes for both DVD and CD operation. Intelligent inputs determine which output should be driven based upon input current levels. Both a power saving mode (both inputs low) as well as an error mode (both inputs high) have been added to enhance application performance.

LDMs utilise high frequency current modulation to suppress the noise of grounded laser diodes. The nominal 400MHz modulation frequency is adjustable for both channels via an external resistor Rf tied to ground.

"Our new modulator addresses customers' concerns about the noise inherent in many laser diodes," said Kevin Plouse, senior VP marketing and business development. "With the SP8110, Sipex is demonstrating its commitment to service the high volume, consumer DVD player market in addition to the high-end DVD-writer segment."

Femto being crowded by atto

Physicists in Austria say they that have observed events separated by the shortest time interval ever, and plan to use the technique to study atomic phenomena. Ferenc Krausz, of Vienna University of Technology, led a group which used pulses of laser light to watch electrons moving around atoms, and were able to distinguish events that took place 100 attoseconds (10^{-16} seconds) apart. The attosecond (10^{-18} s) a quintillionth of a second, is the timescale of atomic events. Krausz and his team say that the research could improve understanding of the role of electrons in superconductivity and in giant magnetoresistance, used in data-storage devices.

Ultraviolet-light pulses of 250-attosecond duration were used to excite electrons in atoms of neon, raising them to a higher energy level. These electrons come out of the atoms with a range of different momenta. A second pulse of light, delivered just after the first, then jolts the electrons. Changing the delay between these two pulses produces a different distribution of momentum values for the electrons, which the scientists measure with a 'streak camera'. Comparing these distributions gave the team a snapshot of how the electrons differed when hit with an early or late second pulse. It is believed the technique could soon be refined to track events a few tens of attoseconds apart, telling physicists how electrons rearrange themselves inside an atom when they move between different orbits.

Progress in using fleeting laser flashes to study short time scales has opened up the field of femtochemistry, in which the motion of atoms and molecules is tracked on the femtosecond (10^{-15} s) timescale, to see how they rearrange themselves during chemical reactions. Probing even shorter timescales could provide more insight.